



National Nuclear Security Administration



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## NIF Essential to Stockpile Stewardship Program

*Editor's note: This is another article in a continuing series on NNSA's Stockpile Stewardship Program.*

The National Ignition Facility (NIF) at Lawrence Livermore National Laboratory in California is essential to NNSA's Stockpile Stewardship Program (SSP). With a facility the size of a sports stadium, it is the only facility that can achieve the conditions of temperature and pressure approaching those that exist in a nuclear weapon.

Not only will NIF facilitate the study of issues that affect an aging or refurbished nuclear weapons stockpile, but, according to Dr. Christopher J. Keane of NNSA's Division of Secondaries and Inertial Fusion, it will also advance critical



**NIF:** Workers install beampath onto a mirror frame under the target chamber.

elements of the underlying science of nuclear weapons.

NNSA researchers are also working toward ignition - the fusion of atomic nuclei and the liberation of more

energy than the fusion fuel first absorbed.

NIF is a part of NNSA's Inertial Confinement Fusion (ICF) program. Powerful energy

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## Russian Language Class Led to Career for NNSA Non-Proliferation Staff Member

Michele Dash's New York City high school offered an introductory class in Russian that began a personal fascination with the language, culture and history of the former Soviet Union. She now serves as the public affairs liaison and special assistant to Deputy Administrator Paul Longworth in

NNSA's Defense Nuclear Nonproliferation program, and she has been able to work extensively on programs that deal with the implementation of nonproliferation policy in the former Soviet Union.

As an undergraduate student at Cornell University, Michelle spent a semester studying Russian in Leningrad

in the fall of 1991. She received her bachelor's from Cornell University in Soviet Studies with a focus on Russian military history. Later, she went on to Yale University, where she received master's degrees in international relations and

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## NIF Essential to SSP

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beams, such as NIF's lasers, are used in ICF to compress and heat fuel to fusion temperatures. The inertia of the fuel itself is used to confine it long enough for fusion to occur.

"Ignition is one of the most important scientific goals in the Stockpile Stewardship Program," Keane said. "Demonstrating ignition in the laboratory is the only means to address stockpile issues related to fusion burn. Ignition will provide an integrated test that will be used to validate advanced simulation and computing codes. Achieving ignition is a grand scientific challenge that will attract and train the exceptional scientific and technical talent needed to sustain stockpile stewardship over the long term."

He said NNSA is developing an integrated activation and early use plan for NIF that provides for first ignition experiments in 2010. The advance in the ignition date is possible because of technical achievements in the ICF program and the adoption of a simpler system for fielding ignition targets.

"A 1995 review of the ignition program concluded the probability of ignition on NIF was 50 percent or greater," he said. "Our confidence in demonstrating ignition on NIF has increased since then. The NIF activation and early use plan will be reviewed by the Defense Science Board."

The NIF project continues to make progress. Since its re-baseline in September 2000, the NIF project has accomplished all of its milestones at or ahead of schedule and within budget.

The first four laser beams have been activated and have been operating for over a year and full equivalent facility performance has

been demonstrated with a single beam of NIF. Several NIF experiments, providing unique data for SSP, have been conducted this year.

## Michelle Dash - HQ

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environmental management. After Yale, she spent two years at the Ford Foundation's headquarters in New York. Michele returned to Russia in 1998 to work for the Foundation's Moscow Office.

"Being in Russia as a student was a wonderful experience," she said, "and working for the Ford Foundation in Moscow gave me a wide variety of experiences and insights. It was astounding to see the differences in Russia from being there in 1991 and going back in 1998. In 1991, I lived like a Russian student. The people were very friendly, but it was heartbreaking to see people reduced to competing and even fighting for small amounts of food in the bread lines, given some of the shortages at that time. The economy improved after that, but then the ruble crashed in 1998 right before I arrived. I saw a lot of people begging in the streets then, but the wealth was also more visible."

Michele's time with the Ford Foundation gave her an introduction to nuclear nonproliferation issues along with a broad overview of non-government organizations (NGOs). "I learned a lot about the NGO community," she said. "One of their

functions is to look critically at government programs. I realize now that it's something we always need to be prepared for in our work."

After she finished her time as a program assistant at the Ford Foundation, Michele went to work for the Pacific Northwest National Laboratory in its Washington, D.C. office supporting DOE's International Nuclear Safety and Cooperation program. She became a federal employee three years ago.

"It's a great fit for me here, given my background," she said. "The people I've worked with have been



**LITHUANIAN PORTAL:** Michele Dash of NNSA's Office of Defense Nuclear Nonproliferation walks through a radiation detection portal provided by NNSA to the Vilnius airport in Lithuania.

very supportive. For example, in 2002, I was able to do a congressional fellowship in the office of Representative James Clyburn of South Carolina. I wanted to learn more about the appropriations process and I came back to NNSA with new insight on how Congress works."



# Sandia's MiniSAR Offers Great Promise For Reconnaissance and Precision-Guided Weapons

Within a year, the NNSA's Sandia National Laboratories will be flying the smallest synthetic aperture radar (SAR) ever to be used for reconnaissance on near-model-airplane-sized unmanned aerial vehicles (UAVs), and eventually on precision-guided weapons and space applications.

Weighing less than 30 pounds, the miniSAR will be one-fourth the weight and one-tenth the volume of its predecessors currently flying on larger UAVs such as the General Atomics' Predator. It is the latest design produced by Sandia based on more than 20 years of related research and development.

The new miniSAR will have the same capabilities as its larger cousins. Like the larger class of Sandia SARs, it will be able to take high-resolution (four-inch) images through weather, at night, and in dust storms; the only difference will be range. The larger SAR can produce an image in the 35

kilometer range due to its larger antenna and higher transmitter power, compared to the miniSAR, which is expected to get a range of about 15 kilometers — more than adequate for small UAV applications. SARs are commonly used for military reconnaissance purposes.

MiniSAR is a revolutionary step forward in this long tradition that will open up a whole new class of applications, says George Sloan, Sandia project lead for miniSAR development.

Sloan, Dale Dubbert, and Armin Doerry created the current approach for miniaturized SARs years ago. The effort incorporated a number of key technologies, including mechanical design, digital miniaturization, RF miniaturization, and navigation expertise.

Last November, after the gimbal (a support device) and electronics teams got the miniSAR down to its

diminutive 30 pounds, they introduced it at a UAV conference. Since then, more than 30 potential customers, including intelligence agencies, UAV manufacturers, and major radar vendors, have visited Sandia to discuss possible licensing and use of the miniSAR.

Future versions of miniSAR are planned that will shrink the total weight to less than 10 pounds by leveraging both in-development and yet-to-be developed Sandia microsystems technologies.

The miniSAR will have two primary applications. It will be used for reconnaissance on small UAVs, such as the AAI Corporation Shadow. The second application is for precision-guided weapons. Current guidance systems for these weapons rely on target designation methods that are subject to jamming and have trouble operating in bad weather and dust storms. MiniSAR is resistant to these problems.



## LIBYAN MATERIALS AT Y-12:

Wackenhut Security Police Officers Pat Galardo, left, and Terry Hamm, stand guard over crates of unclassified nuclear material and equipment at the Y-12 National Security Complex during a White House Press Corps media tour led by Secretary of Energy Spencer Abraham. A joint American and British team that included personnel from the Departments of Energy, State and Defense brought the materials to the U.S. for evaluation, testing, and destruction. Future shipments of Libyan materials will also be placed in secure storage at Y-12.

# NNSA Names Steve Taylor Manager of Kansas City Site

NNSA Administrator Linton Brooks recently announced that Steve Taylor has been selected as manager of the NNSA's Kansas City Site Office (KCSO).

Helping to provide NNSA oversight is not a new experience for Taylor. From April 1, 2003, until his current position, he was acting manager of the KCSO.

In addition, Taylor spent the past 17 years as deputy site manager for KCSO under the leadership of the last three managers – Earl Bean, Dave Gurule, and Elizabeth Sellers.

“Steve is an outstanding professional whose experience and institutional knowledge of NNSA issues will continue to greatly benefit this organization,” said Brooks.

Taylor's contributions to the federal government have deep roots.



New KCSO Manager: Steve Taylor

He joined the Atomic Energy Commission as a technical intern in 1964, where he worked as a computer programmer and systems analyst. Since then, Taylor has served in a number of highly responsible capacities at DOE headquarters and the former Albuquerque Operations Office (AL), such as technical information program manager and freedom of information officer, among others.

Taylor also served as the executive officer to the AL manager and the weapons data program officer in the Office of Military Applications at DOE headquarters. Currently, he is actively involved in the Kansas City Federal Executive Board.

## Laboratory Communicators Capture 40 Awards

Dawn Giuliano, left, of Philadelphia, and her nephew, 5-year-old Ryan Mielke of Los Alamos, look at the “Mission: Stockpile Stewardship” exhibit in Los Alamos National Laboratory's Bradbury Science Museum. The four panels, designed by Jay Tracy of the laboratory's Communication Arts and Services Group, won a Best of Show in Technical Art award in a recent Society for Technical Communicators (STC) competition. It was one of 40 STC awards the lab received in the competition.



Got an article for the NNSA Newsletter? Submit it to [ASTotts@doeal.gov](mailto:ASTotts@doeal.gov)



# Livermore Develops Test Containment Vessel

Lawrence Livermore National Laboratory scientists and engineers have successfully tested a prototype composite containment vessel for explosive experiments. This may become vital to the future of the National Nuclear Security Administration's effort to ensure the safety and reliability of the nation's nuclear stockpile without nuclear testing.

The new design vessel is built to accommodate the more stringent containment standards that are likely to be in place for a variety of explosives tests in the future, especially those involving nuclear material.

The development of a full-size 2 meter vessel has been a joint project with Los Alamos National Laboratory (LANL), home to the state-of-the-art Dual Axis Radiographic Hydrotest Facility or DARHT. LANL may house the next generation Advanced Hydrotest Facility - experimental facilities likely to use the newly designed vessels.



**EXPLOSIVE EXPERIMENT CONTAINERS:** Prototype containment vessel for explosive experiments.

# Los Alamos Weapons Program Restructured

Los Alamos National Laboratory is restructuring its nuclear weapons programs, beginning with the addition of a new directorate headed by a principal associate director for nuclear weapons programs.

The new associate director has overall responsibility for setting priorities, planning, allocating resources and monitoring execution of the entire nuclear weapons portfolio at the laboratory, and will chair the Nuclear Weapons Program Integration Board (PIB).

The directorates for Weapons Physics, Weapons Engineering and Manufacturing, and Operations will retain line responsibilities for all activities in the 16 divisions that report to them. The existing program boards - Stockpile Assessment and Certification;

Experimental Assessment and Validation; Simulation; and Manufacturing - currently subordinate to the PIB, will evolve into a single coordination board that will link program directors and division leaders for all sectors of nuclear weapons work at Los Alamos.

Director G. Peter Nanos has begun a nationwide search for permanent associate directors for the new Nuclear Weapons Programs Directorate and the Weapons Physics Directorate most recently led by Raymond Juzaitis. Nanos has named Donald R. McCoy to the new post in an acting position, and Physics Division Leader Susan Seestrom as acting associate director for weapons physics. Richard Mah remains associate director for weapons

engineering and manufacturing.

"I believe this restructuring will result in a significant increase in programmatic focus, and much-improved definition of responsibilities, resulting in more timely and effective management of priorities," said Nanos. "In addition, the new directorate will clarify authorities for resource allocation, responsibilities, schedule, costs and performance, achieve better balance of program and line scope for the other associate directorates, and improve coordination with NNSA and the laboratory's chief financial officer.

"It is my goal in taking these steps that these key programs will quickly see improved communications and greater clarity of program and line management missions and responsibilities," said Nanos.

# Neutron Science Center At Los Alamos Helps Test Circuits For Failures From Cosmic Rays

Life today runs more and more on circuits. Electrons racing through increasingly tiny transistors now control our airplanes, deposit money in our checking accounts and keep our houses warm.

But these miniature devices face an invisible enemy from outer space that can strike computer chips, miniaturized controls and other complex integrated circuits, spoiling the digital work that permeates 21<sup>st</sup> century human activity.

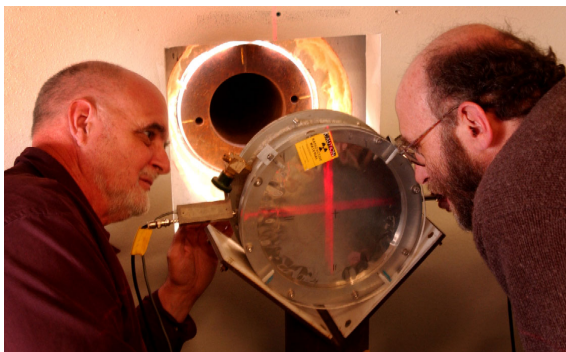
Researchers at Los Alamos National Laboratory's Neutron Science Center, or LANSCE, are using a powerful proton accelerator to speed up the potential for failure, battering circuits in a single hour with hundreds or thousands of years of the harmful neutrons created by cosmic rays. Aviation, computer and related companies, along with the National Aeronautics and Space Administration, are putting circuits through the rigors of the LANSCE neutron testbed, located in a modest steel structure known as the ICE House, for Irradiation of Chips and Electronics.

LANSCE is a Defense Programs (DP) facility and about 75 percent of its budget comes from DP.

"We can generate essentially the entire neutron spectrum produced naturally by cosmic rays, but with neutrons a million times more intense than in nature," said Steve Wender, who leads the Neutron and Nuclear Science Group at LANSCE.

When cosmic rays from deep space strike Earth's upper atmosphere, they ultimately create

neutrons that shower down on the Earth's surface. These neutrons pose little health hazard because the radiation dose is relatively low. However, each



**FISSION CHAMBER:** Richard Hess, Honeywell Aerospace Electronic Systems and Steve Wender, Neutron and Nuclear Science Group at LANL, adjust the fission ion chamber that measures the number of neutrons passing through it to the circuits or devices being tested.

neutron can interact with silicon and other elements in integrated circuits to produce charged particles, with potentially disastrous impacts on memory and chip function.

"We can't fully predict the effect of these interactions, which makes having a standardized way to test circuits extremely valuable," Wender said. "Very similar devices show radically different failure rates due to neutron interactions, and we have some evidence that the smaller transistors and lower operating voltages in newer devices produce higher failure rates."

Each individual neutron has an exceedingly small probability of damaging a single bit and thus disrupting circuit performance. However, since new electronic devices require more and more bits, manufacturers are seeing errors more frequently. Neutrons go through devices one at a time, but the increased intensity available in the ICE House greatly reduces the time between neutrons and the failure that they cause.

In the case of the latest, totally computer-controlled aircraft, these tiny cosmic gremlins could cause trouble, especially because the problem gets worse as atmospheric shielding dwindles at higher altitudes.

Circuit manufacturers understand the risk posed by cosmic ray neutrons and try to design around it, so LANSCE's ICE House increasingly is becoming an international standard for putting new circuits through their paces. In fact, the Joint Electron Device Engineering Council established JESD89, a standard for integrated circuit testing, based on the suite of experimental capabilities at the Icehouse.

Los Alamos has been putting circuits through their paces at LANSCE for more than a decade. Demand for the testbed has grown so much that the waiting list is several months long, Wender said. Typically, companies will test circuits for up to five days, though some have used the testbed for twice that long.

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# Operation Synergy: NNSA Exercises With Federal, State, Local Emergency Responders

In the event of a radiation release either at one of the nation's nuclear power plants or by terrorist action the NNSA has the assets and people to respond. In a recent exercise in Los Alamos, Calif., the NNSA's Nevada Site Office responded with its Federal Radiological Management and Assessment Center (FRMAC) assets to assist state and federal responders.

FRMAC, simply, is the scientific expertise and equipment found within NNSA and the national laboratories. The equipment and personnel are mobilized to integrate not only NNSA assets, but local radiological assets. Data collected by these trained specialists is compiled and quality checked. The information is then passed on to the local decision makers so they can make decisions affecting evacuation, sheltering-in-place, and what to do with food and agriculture supplies.

In the exercise scenario, known as Operation Synergy, a stash of

drawings were discovered by law enforcement in a remote Arizona border town motel that depict radioactive material configured with dynamite. Additionally, knowledge that kilocuries of cesium and strontium were missing from a Nevada Test Site shipment set the

buildings were at the center of the explosion and contamination.

Admiral Joseph Krol, observing his first exercise as the new NNSA associate administrator for emergency operations, said, "I am very impressed with the ability of our people to set up and integrate all of

the various local, state and federal assets into our data collection organization."

As with any exercise, there are lessons learned. But perhaps the biggest value of an exercise of this type is for emergency responders at all levels to interact with one another. Don Daigler, Nevada Site Office FRMAC

director said, "We find that many communities do not know what assets and

capabilities we have to offer. These outreach efforts help us to build relationships and let local and state governments know how we can be there to assist them."



**EMERGENCY RESPONDERS:** Don Daigler (right), NNSA Nevada Site Office, briefs a joint group of responders on radiation data collected during an aerial survey. The joint group is made up of representatives from the

stage for the exercise. Before the terrorist device could be found by law enforcement, the crude weapon of mass destruction was set off in a park. Schools, businesses, power systems, and local government

## News Briefs

### DOE Tribal Leaders Summit

Tyler Przybylek, NNSA chief operating officer and general counsel, represented NNSA at the first DOE Tribal Leaders Summit. The historic summit, titled Working Together for Our Energy Future, brought together DOE, NNSA, and tribal leaders to exchange information on

departmental issues that impact American Indian Tribes. Przybylek provided an overview of NNSA's activities, its consultation process, and its relationship with tribal governments in the communities adjacent to NNSA laboratories and facilities. The summit took place during the 2004 Executive Council Winter Session of the National Congress of American Indians.

### New Electronic Newsletter Debuts

The NNSA Office of Diversity and Outreach has begun publishing *Diversity Highlights*, an electronic newsletter honoring the contributions that NNSA's diverse populations make to the cultural, historical, social, and scientific development of American society. *Diversity Highlights* is published twice a

# Survey Names LLNL A Top Workplace for Postdocs

Lawrence Livermore National Laboratory (LLNL) is one of the nation's best workplaces for postdocs, according to a recent survey conducted by *The Scientist* magazine.

Survey participants ranked the lab seventh among 61 U.S. institutions on such key workplace factors as access to publications and journals, high-quality research tools, scientific career preparation, communication and collegiality, and quality research.

A report on the survey, published in the magazine's February 16 edition, summarized responses to a web-based questionnaire from 3,529 researchers in tenure and tenure-track positions in Western Europe, Canada and the United States.

According to the magazine, the survey's participants rated access to a comprehensive collection of journals and books and high-quality research tools as the most important attributes of a research institution for postdocs. They also noted the value of career preparation, which involves both

scientific coaching and job advice.

LLNL was one of five federally funded research facilities among the top 15 on the list. Laura Gilliom, director of the lab's University Relations Program and a member of the PDAC, said LLNL is especially

attractive to postdocs with degrees in physics, chemistry, and other physical sciences who recognize the growing opportunities for seminal bioscience research.

"Livermore has a long tradition of scientific and technical vitality and interdisciplinary research," said Gilliom. "The postdocs who come

here know they will be able to do cutting-edge research using the world's most advanced lasers, accelerator mass spectroscopy and nuclear magnetic resonance spectroscopy tools, and to couple experimental and computational science."



**LLNL TOP WORKPLACE:** LLNL Acting Deputy Director Hal Graboske, and Lori Turpin, chair of the Lab's Postdoc Advisory Committee, examine the certificate commending the Lab as one of the best places for postdocs, as surveyed by *The Scientist* magazine.

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month during the period marking special emphasis or employee interest group observances, in collaboration with the NNSA Diversity Council's Special Emphasis Program Managers and Employee Interest Groups.

### **Cooperative Agreement to Enhance National Security**

A new memorandum of understanding between the Lawrence Livermore National Laboratory and

the U.S. Naval Postgraduate School (NPS) in Monterey, Calif., establishes a research collaboration between the two institutions. The cooperative agreement will provide NPS students the opportunity to work with lab researchers on projects to enhance national security.

Livermore will benefit from the program through the strong educational, military research and operational expertise at the NPS. NPS will benefit from the lab's strength in applied sciences with core capabilities in nuclear weapons

stewardship, nonproliferation, advanced defense and homeland security technologies, plus a wide array of scientific and engineering expertise.

The cooperative arrangement also formalizes an existing Livermore visiting-faculty position at NPS. Craig F. Smith, a Ph.D. engineer from the lab's Energy Technology Division, has been selected to fill the Lawrence Livermore chair professor position.